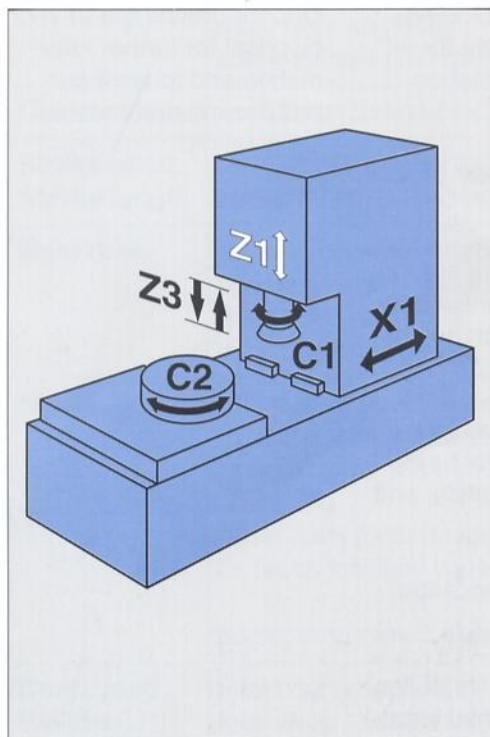
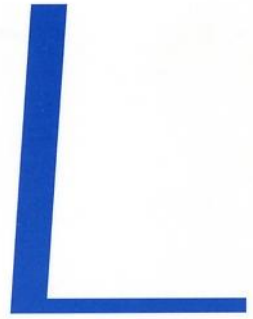


# LORENZ Gear Shaping Machine LS 156



**LORENZ**  
ETTLINGEN

# LORENZ Gear Shaping Machine LS 156

**Proven  
LORENZ  
machine  
concept  
with  
SIEMENS  
control  
and drive  
techniques**

The LS 156 is an upgraded version of the proven LS 154 and combines the latest development of machine concept with the modern SIEMENS CNC-control. The high demands expected of production machines in today's manufacturing processes have been met in the LS 156 gear shaping machine concept. Apart from the optimization of the mechanical sub-assemblies, the CNC-control has been completely redesigned. For the general user, the LS 156 is now available with an adjustable machine column, infinitely variable from 0-10 degrees. These consequent developments offer the user quite a number of advantages, such as:

- 4 CNC-axes as standard equipment (C1-, C2-, X1- and Z3-axes)
- optional automatic stroke positioning adjustment (Z1-axis)
- SIEMENS state-of-the-art control and drive techniques
- operator guidance by WINDOWS®-technique
- flat colour display as standard equipment
- extensive software offer
- fixed work table and radially moving machine column as a prerequisite for automation
- usable machining methods, i.e. generating, indexing, index-generating, sector profile shaping, and special shaping applications
- selectable infeeds, i.e. constant or constantly decreasing radial feed, radial feed with or without rotary feed, spiral infeed (LORENZ-CCP-method)
- tool positioning for optimum tool strategies
- machine bed optimized by the Finite-Element-Method for thermal stability
- automatic correction of temperature depending centre distance variations
- modular machine enclosure suitable for all types of automation systems
- work area freely accessible
- automatic work area interlock for highest possible protection against accidents
- separate hydraulic circuits for control functions, hydrostatics, and lubrication
- circulating lubrication system
- monitoring systems for all hydraulic, hydrostat-
- ic, and lubrication filters
- machine setup on vibration isolating machine mounts
- additional pneumatic or hydraulic elements at option

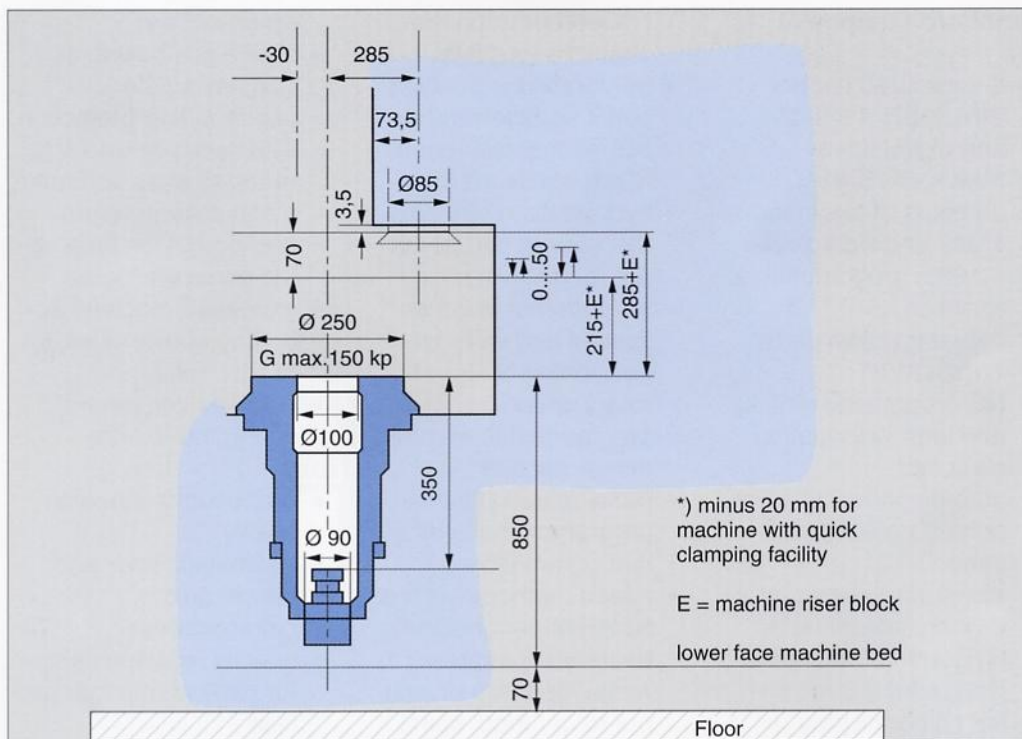
Further equipment available for the LS 156 gear shaping machine:

- CNC-chamfering attachment to machine tooth edges
- spinning and deburring stations
- workpiece transport attachments with automatic storage and loading systems
- gear cutting tools

Our specialists are at your disposal for further information and to work our problem-related machining solution.



**Work range  
LS156**



<b>Machine characteristics</b>	normal module 1)	mm	5
	max. workpiece pitch circle diameter 2) 4)	mm	150
	max. face width (spur gear) 3) 4)	mm	42
	max. helix angle 3)	degrees	45
	cutter spindle tilt angle	degrees	-0.5...+0.5
<b>Centre dist.</b>	work table/cutter spindle 4)	mm	-30...+285
<b>Stroke posit., Stroke length</b>	max. stroke positioning range 4)	mm	70
	stroke length adjustment range	mm	0...50
<b>Main drive</b>	speeds infinitely variable standard	DS/min	250..1500
	speeds infinitely variable option	DS/min	400..1800
	main drive motor	kW	5.5
	max. cutting speed	m/min	150
<b>Feeds</b>	rotary axes (tool C1-, workpiece C2-axis) feeds infinitely variable (related to 100 mm pitch circle diameter)	mm/min	2.4...9425
	radial axes (column slide X1-axis) feeds infinitely variable	mm/min	1...4800
	power traverses = max. feeds		
<b>Conn. load Weight</b>	total connected load	kVA	23
	total weight (standard version)	kg	ca. 8,000

**Technical  
data  
LS 156**

1), 2), 3), 4), for explanations see page 8

# LORENZ Gear Shaping Machine LS 156

## Machine equipment

### Standard equipment

- 4-axes CNC control SINUMERIK 840 C and digital drives SIMODRIVE 611D
- numbers of teeth: tool 1-999 and workpiece 1-1999, programmable at option
- operator guidance by WINDOWS®
- NC-programme writing and fault indication in clear text
- auto-diagnosis of all important control functions
- measuring system metric/inch selectable by programme command
- integrated PC
- flat colour display
- electronic handwheel
- V 24 interface including VDE/DIN outlet for power supply
- automatic correction of temperature depending centre distance variations
- number of strokes or stroking speeds infinitely variable, programmable in DS/min or m/min
- cutter spindle stroking movement by inching button
- automatic reversal of cutting direction down-shaping/up-shaping
- cutter stroking stop at any position programmable
- stroke length adjustment mechanical-manually
- stroke position adjustment mechanical-manually
- infinitely adjustable

back-off position mechanical-manually

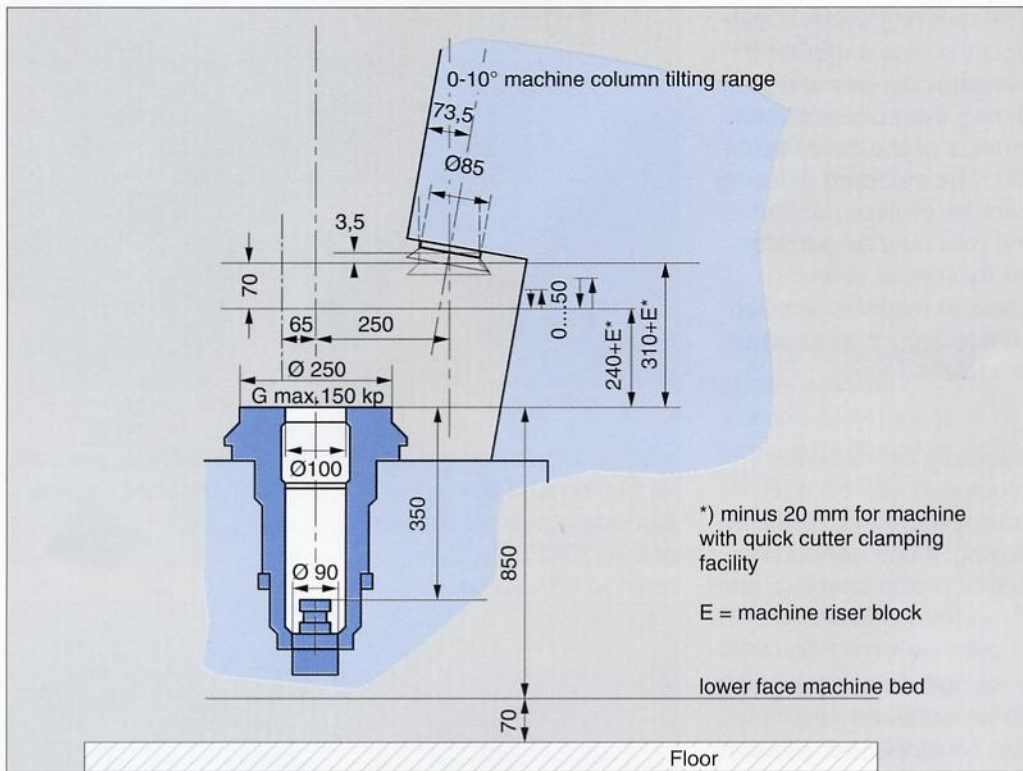
- perpendicular position cutter spindle/work table mechanical-manually adjustable  $\pm 0.5^\circ$
- hydrostatic cutter spindle, spur or helical guide, respectively
- programmable cutter spindle and work table positioning
- rotary speed infinitely programmable in mm/min or mm/DS
- radial speed infinitely programmable in mm/min or mm/DS
- infeed methods such as constant or constantly decreasing radial feed, radial feed with or without rotary feed, spiral infeed (LORENZ-CCP-method), index-generating method, single indexing, sector profile shaping, special applications (i.e. turning, deburring)
- electrical work area protection and interlock by means of safety device
- machine partly enclosed
- circulation lubrication system
- tool cooling attachment
- machine setup on vibration isolating machine mounts
- operating tools
- operating and programming instructions

### Optional and additional equipment

- special versions to comply with customer's

specifications

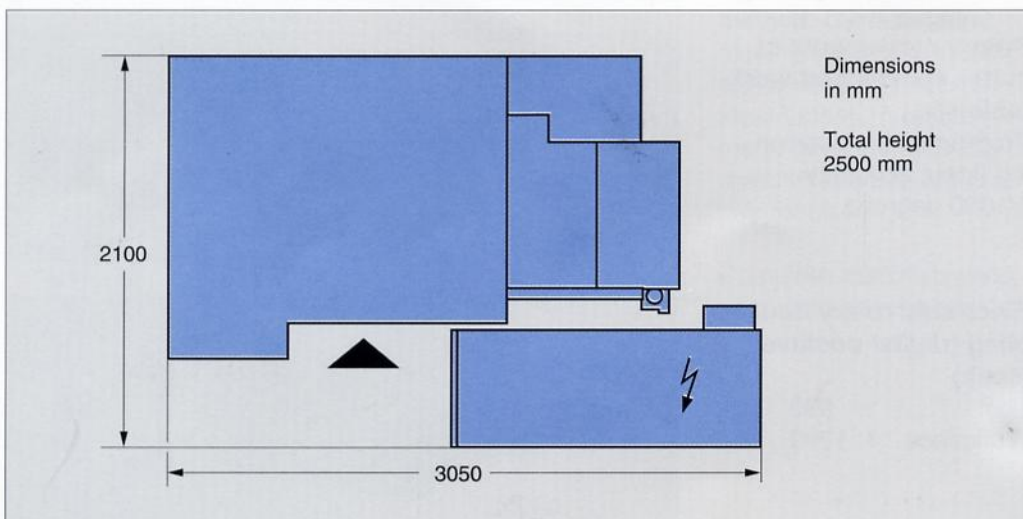
- stroke positioning as CNC-axis (Z1)
- power failure protection with synchronized stop of rotary axes and automatic column return
- cooling device for electric panel enclosure
- increased machine accuracy quality class 5 to DIN 3962
- machine column infinitely tiltable from  $0 - 10^\circ$
- quick cutter clamping facility
- hydrostatic spur and helical guides
- cutter adapter
- special relieving cam for particular length profiles
- machine riser blocks
- lateral column offset  $\pm 20$  mm mechanical-manually
- chip conveyor
- electrostatic oil mist separator
- work arbour support
- hydraulic clamping cylinder
- built in 3.5" disc drive (SIEMENS)
- work arbour support retracting unit
- centering flange and draw bar
- central control unit for pneumatic devices
- hydraulic power pack for hydraulically operated attachments
- magnetic activator for optimizing the coolant and to increase the tool life



**Work range  
tilt column  
LS 156**

<b>Machine characteristics</b>	normal module 1)	mm	5
	max. pitch circle diameter 2) 4)	mm	150
	max. face width (spur gear) 3) 4)	mm	42
	max. helix angle 3)	degrees	45
	cutter spindle tilt angle	degrees	-0.5...+10.5
<b>Centre dist.</b>	centre distance work table/cutter spindle 4)	mm	-65...+250

**Technical data tilt column  
LS 156**



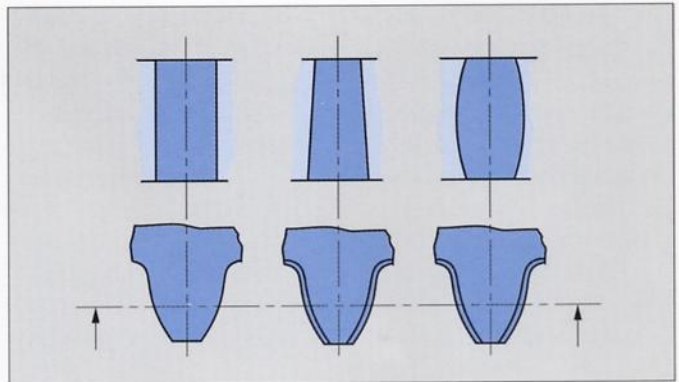
**Machine setup  
LS 156**

1), 2), 3), 4), for explanations see page 8

# LORENZ Gear Shaping Machine LS 156

## Relieving system

The relieving system controls the axis angle between workpiece and tool during the work and return strokes of the cutter spindle. The standard relieving cam for profiles parallel to the axis may be substituted by special relieving cams to machine special contours such as tapered or crowned teeth.



## Machining process

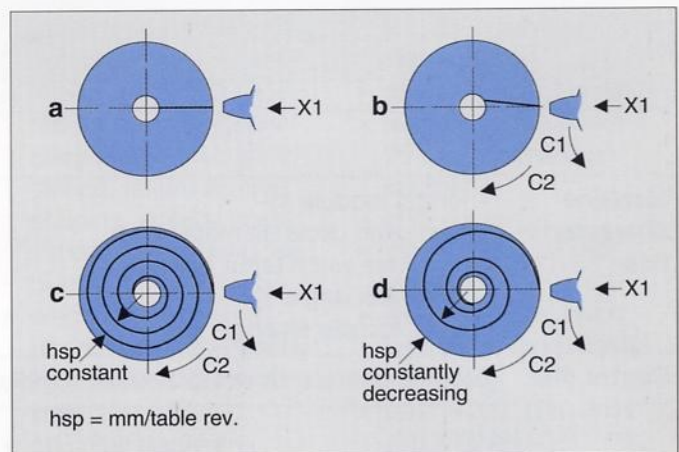
Basically the following processes can be realized: generating, single indexing, index generating, sector profile shaping, and

special applications such as turning and deburring. Generating allows the use of the LORENZ-CCP-method with spiral

infeed, fast finish generating and additional spring cuts

## Infeed methods

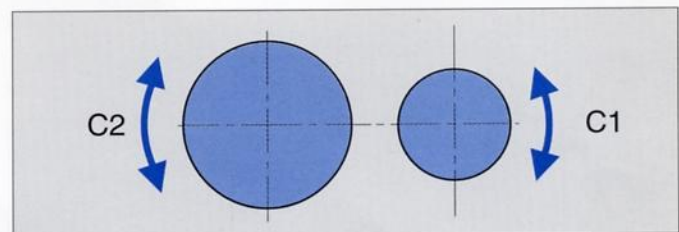
In its standard version, the shown infeed methods can be employed: radial feed without rotary feed (a), radial feed with rotary feed (b), spiral infeed with constant radial feed (c), and spiral infeed with constantly decreasing radial feed (d).



## C1-axis C2-axis

### Rotary movements of cutter spindle and work table

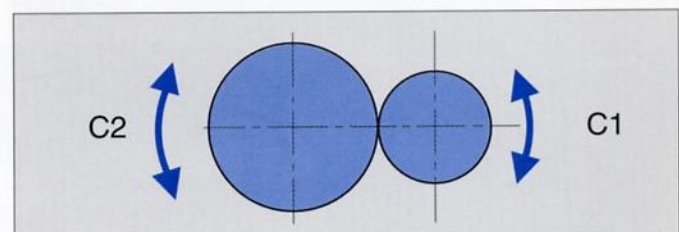
Programmable positioning. Input accuracy 1/1000 degrees.

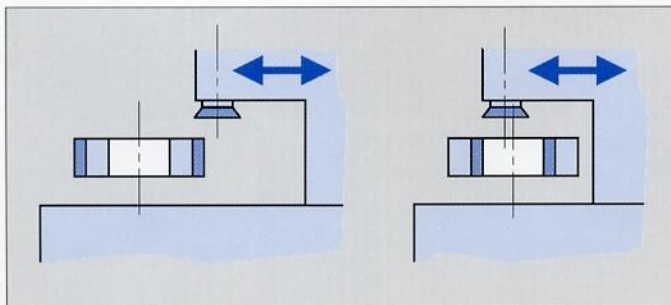


## C1-C2-axes

### Electronic rotary coupling (digital positive mesh)

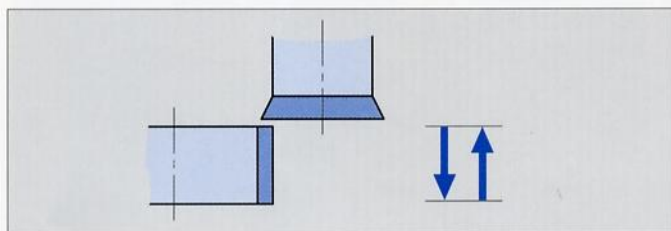
Tool 1: 999  
Workpiece 1: 1999





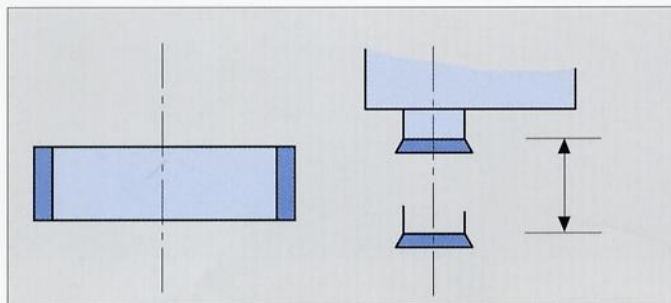
#### Radial movement of column slide

Programmable positioning. Input accuracy 1/1000 mm



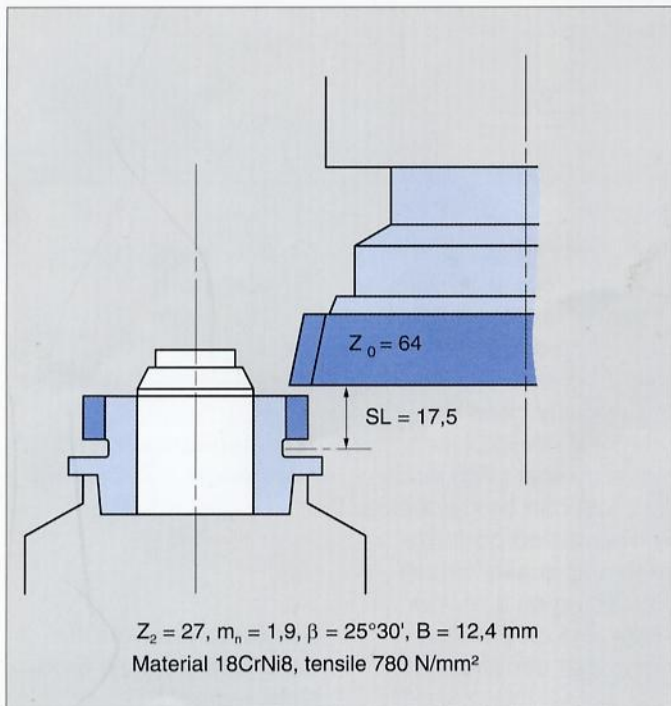
#### Stroke movement of cutter spindle

Various numbers of strokes programmable in DS/min. or cutting speeds in mm/min.



#### Stroke position adjustment of cutter spindle

Stroke position infinitely variable up to a max. of 65 mm. Input accuracy 1/1000 mm



#### Example: Shaping of a helical gear

Shaping of a helical gear to pre-shave condition using the LORENZ-CCP-method. Cycle time including automatic loading and unloading 0.91 minutes. Optimum result made possible by using spiral infeed and high rotary feeds.

Complete machining and gear data on request.

## X1-axis

## Z3-axis

## Z1-axis (optional)

## Machining example

# LORENZ Gear Shaping Machine LS 156

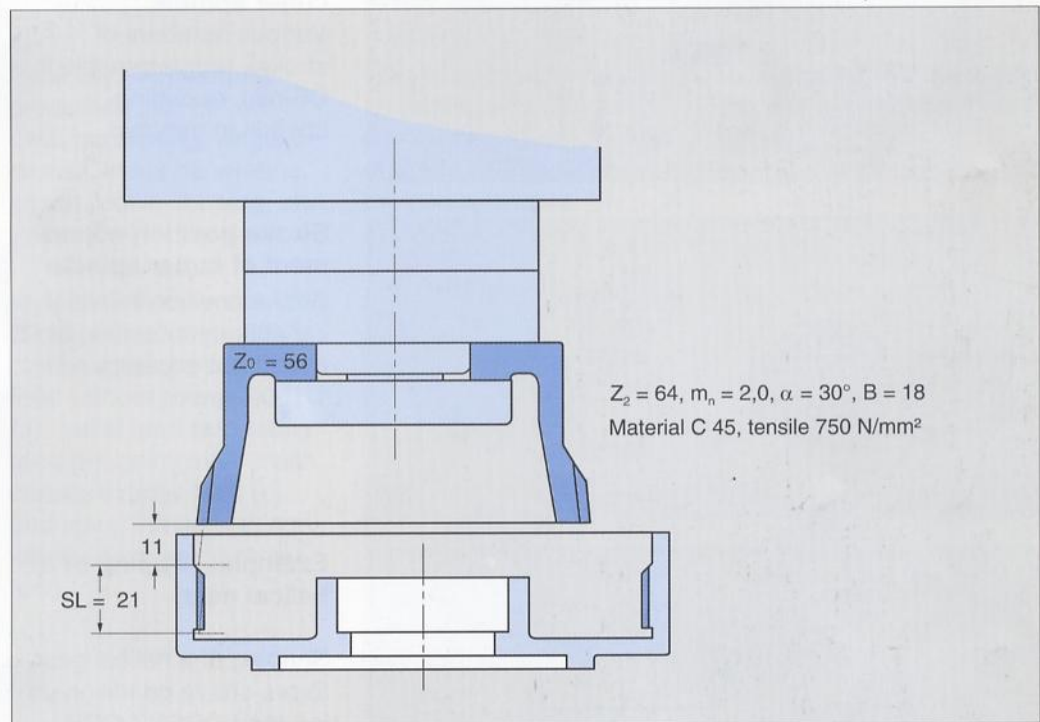
## Machining example

### Example: Recessed internal gear

Finish-shaping of a recessed internal gear to accuracy class 8 to DIN 3962. On account of the workpiece configuration and to achieve a high cutting capacity, a hub-type cutter is used.

The automatic stroke positioning lowers the shaper cutter by 11 mm. Cycle time with automatic loading 0.57 minutes.

Complete machining and gear data on request.



## Explanations

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**LORENZ**  
ETTlingen

### 1) Normal module

The stated module can be exceeded when the cutting conditions are adjusted to the tooth space transverse dimensions, the workpiece material and the workpiece form.

The module is not a performance indicator, but only a characteristic quantity.

### 2) Workpiece pitch circle diameter

Reference diameter based on working accuracy of quality class 6 to DIN 3962. Workpieces with a greater pitch circle diameter can be machined with restricted performance and quality values depending on the work range and on tool and workpiece dimensions.

### 3) Face width 3) Helix angle

Special versions possible.

### 4) Dimensions based on tilt angle = 0 degrees

**Our individual quotations apply for all technical aspects.**